# The Growth of the Financial Guarantee Market

Financial guarantees are instruments of credit enhancement which insure security purchasers against default and provide lower borrowing costs to issuers. The issuer or underwriter of a security purchases a financial guarantee to insure the timely payment of principal and interest in the event of the issuer's default. In general, this guarantee is unconditional and irrevocable, contains no deductible and constitutes a legal obligation of the insurer to the security holder. The guarantee is written for the life of the security, which, in the case of municipal bonds, can be as long as 30 years. Since the capital and resources of the insurer are pledged to back the insured security, the financial guarantee makes the security more marketable and reduces interest cost to the issuer. The financial guarantee, in effect, is a means for the insurer to "rent" its superior credit rating to security issuers whose own ratings are lower. The wedge that permits this transaction is the interest cost saved by the issuer.

The first financial guarantee product, municipal bond insurance, was developed in the early 1970s, and since that time, the market has expanded to include guarantees on a variety of instruments in both the municipal and corporate debt markets. Until the late 1970s the financial guarantee market consisted of just two firms which wrote guarantees for municipal bonds. The relationship among these firms, state insurance regulators, professional associations and the major credit rating agencies was straightforward and well established. Since 1981, however, the market for municipal bond insurance in particular and financial guarantees in general has grown significantly. Financial guarantees are now written for many different types of securities, including limited partnership obligations, consumer receivable-backed securities, mortgage-backed securities, long-term and short-term corporate debt and taxable industrial revenue bonds. Another class of financial guarantees is being written to cover credit risk in such transactions as interest rate and currency swaps.

The purpose of this paper is to decribe the cyclical behavior of the financial guarantee market and to discuss the factors which contributed to the market's recent growth. Like other property/casualty insurance lines, financial guarantees are subject to an underwriting cycle that is largely determined by changes in interest rates. Interest rates affect the financial guarantee cycle by influencing both the investment income of insurers and the interest cost savings of debt issuers. As the theory developed in this paper suggests, these influences cause the quantity of financial guarantee insurance underwritten to rise and fall with the level of interest rates. Interest rates also affect the financial guarantee market through their impact on the rest of the property/casualty insurance industry. Periods of high interest rates also tend to be periods of underwriting losses for property/casualty insurers. Since high interest rate environments correspond with the peak of the financial guarantee underwriting cycle, property/casualty insurers have incentive to redirect capital resources to the financial guarantee market when interest rates are high. Thus, the cyclical behavior of the property/casualty industry reinforces the cyclical behavior of the financial guarantee market.

While interest rates and the property/casualty underwriting cycle affect the cyclical pattern of the financial guarantee market, some part of the growth in the market

in the 1980s can be attributed to other factors. These factors include a general secular expansion of the market for credit enhancement services, changes in the federal tax code and the increase in innovation of products and services in securities markets. The financial guarantee market was also influenced by the growth of markets for alternative credit enhancement devices such as commercial bank letters of credit. The fact that these longer term influences coincided with the upswing of the underwriting cycle in the financial guarantee market led to the tremendous expansion of the market in the early 1980s. More recently, expansion in the market has slowed, as the fall in interest rates has moved the underwriting cycle into a relatively contractionary phase. The behavior of the market during this downswing, combined with regulatory proposals which could constrain financial guarantee activity, is likely to shape the nature of the market in its more mature stage.

## Growth in premium volume

The growth of the financial guarantee market is best illustrated by the sharp increase in financial guarantee premiums in the 1980s. Unfortunately, comprehensive measures of financial guarantee premiums are not readily available since insurers have not been required to break out financial guarantee business from other insurance lines in annual reports to state insurance regulators. An estimate of financial guarantee premiums can be derived, however, from data on surety bond premiums. A surety bond is "an agreement providing for monetary compensation in the event of a failure to perform specified acts within a stated period."[1] Financial guarantees are technically a surety product and surety premium data from reports to state insurance regulators can be used to infer the growth in financial guarantee premiums.[2]

Table 1 demonstrates the growth of surety premiums between 1976 and 1985. The rate of growth of surety premiums accelerated between 1982 and 1985, averaging 26.4 percent a year, as opposed to 12.8 percent a year during the period 1976 to 1982. Surety premiums reached $2.5 billion in 1985, nearly five times their level in 1976.

A second source of data about financial guarantee premiums comes from the Surety Association of America. The Surety Association collects surety premium data by surety product from its member insurers. Membership in the association is voluntary, however, and financial guarantee insurers are underrepresented in the membership. This underrepresentation, combined with a tendency for financial guarantee business to be classified under "all other surety," means that the Surety Association's financial guarantee premium figures understate the actual volume of financial guarantee premiums. This underreporting is reflected by the fact that total surety premiums as measured by the Surety Association rose an average of only 12.5 percent between 1980 and 1985 (Table 2). Reported premiums for all financial guarantees rose considerably faster, however, increasing an average of 70 percent a year. Breaking the surety premium data down by product, municipal bond insurance premiums grew by 60 percent a year and premiums for other financial guarantees—including those for commercial investment and corporate debt enhancement—grew at over 80 percent a year, with most of the increase coming after 1982. In 1980, financial guarantee premiums accounted for just 3 percent of the total direct written premiums reported to the Surety Association. In 1985, they accounted for 24 percent.

The detailed Surety Association data can be used to make an estimate of financial guarantee premiums for all insurers. The surety premium data from reports to state regulators reflect the surety activity—both financial guarantee and traditional surety—of all insurers. Assuming that the Surety Association's premium data for traditional surety products is an accurate measure of the activities of all insurers in this area, then the Surety Association's traditional surety premium data can be subtracted from the state regulators' total surety premiums to provide a comprehensive estimate of financial guarantee premiums.

These estimates are reported in Table 3. Total estimated financial guarantee premiums increased an

[1] *1985-86 Property/Casualty Fact Book* (Insurance Information Institute, New York, 1985).

Table 1

**Premium Volume – Surety**

| Year | Direct Written Premiums (in thousands of dollars)* | Percent Change |
|---|---|---|
| 1976 | 589,568 | — |
| 1977 | 696,350 | 18.1 |
| 1978 | 835,919 | 20.0 |
| 1979 | 902,552 | 8.0 |
| 1980 | 1,000,732 | 10.9 |
| 1981 | 1,088,848 | 8.8 |
| 1982 | 1,216,634 | 11.7 |
| 1983 | 1,488,641 | 22.4 |
| 1984 | 1,911,182 | 28.4 |
| 1985 | 2,454,556 | 28.4 |

*Premiums paid by policy holders, 50 states and District of Columbia.
Source: A.M. Best Co., Executive Data Service

[2] These data are compiled from state insurance regulators' reports by the A.M. Best Company.

average of 47.3 percent between 1980 and 1985, reaching a level of $1.3 billion. Although this is slower than the 70 percent annual rate of increase implied by the Surety Association's financial guarantee premium data, the estimated premium data indicate a relatively steady rate of growth through 1985. Financial guarantee premiums increased by more than 50 percent in every year between 1982 and 1985.

### A model of the financial guarantee market

The growth in the financial guarantee market reflected in these premium data can be attributed to both cyclical and noncyclical factors. In order to understand the cyclical component of the financial guarantee market, it is necessary to understand how financial guarantees are valued by security issuers and priced by insurers. Clearly, the issuer of a security will be willing to purchase a financial guarantee only if the price of the guarantee is less than the savings that result from the purchase of the guarantee. Similarly, insurers will be willing to sell a guarantee only if the premium received is greater than the expected loss from the guarantee plus administrative costs. This section discusses a model of the financial guarantee market that incorporates these decision rules.[3]

The central assumption of the model is that financial guarantee insurers are more effective credit analysts than other capital market participants. When a security is issued, market participants make an assessment of its credit risk and the market yield on the security will reflect this assessment. By shifting the ultimate liability for a security's principal and interest payments from the borrower to the insurer, a financial guarantee lowers the security's credit risk and reduces its required market yield. The difference in total financing costs between the uninsured and the insured security can be interpreted as the market price of the security's risk and represents the maximum amount that a borrower would be willing to pay for a financial guarantee. Clearly, this interest cost reduction depends upon the credit market's initial assessment of the security's risk. This assessment may be inaccurate, however. If a financial guarantee insurer can determine that the security's true credit risk is lower than the risk perceived by the capital market, then the insurer will be willing to sell a financial guarantee and assume the credit risk from the security holder at less than the risk's market price. It is this wedge between the interest cost savings realized by the borrower and the "true" price of the risk as discovered

[3]Details and further discussion of the model can be found in the appendix.

Table 3

**Estimated Financial Guarantee Premium Volume (in thousands of dollars)**

| | Total Surety Premiums | Nonfinancial Guarantee Surety Premiums | Estimated Financial Guarantee Premiums |
|---|---|---|---|
| 1980 | 1,000,732 | 813,585 | 187,147 |
| 1981 | 1,088,848 | 890,841 | 198,007 |
| 1982 | 1,216,634 | 887,124 | 329,510 |
| 1983 | 1,488,641 | 966,933 | 521,708 |
| 1984 | 1,911,182 | 1,054,046 | 857,136 |
| 1985 | 2,454,556 | 1,156,561 | 1,297,995 |

Source Column 1: A.M. Best Co.
Column 2: Surety Association of America

Table 2

**Surety Premiums by Product (in thousands of dollars)**

| | Financial Guarantees | | | | | Traditional Surety | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total Financial Guarantees | Municipal Bond Guarantees | Commercial Investment Loan Guarantees, Corporate Debt Credit Enhancement | All Other Commercial Loan Guarantees | All Other Financial Guarantees | All Contract | Worker's Compensation + Depository | All Other Surety | Total Surety |
| 1980 | 25,247 | 12,951 | N/A* | N/A | 12,296 | 574,540 | 12,416 | 226,629 | 838,832 |
| 1981 | 64,122 | 46,345 | N/A | N/A | 17,777 | 604,666 | 14,664 | 271,511 | 954,963 |
| 1982 | 108,763 | 76,568 | N/A | N/A | 32,195 | 594,077 | 16,804 | 276,243 | 995,887 |
| 1983 | 191,050 | 95,651 | N/A | N/A | 95,399 | 640,918 | 18,081 | 307,934 | 1,157,983 |
| 1984 | 348,062 | 150,920 | 2,255 | 12,416 | 182,471 | 680,390 | 25,985 | 347,671 | 1,402,108 |
| 1985 | 358,037 | 123,509 | 43,669 | 53,881 | 136,978 | 769,674 | 16,830 | 370,057 | 1,514,598 |

*N/A = not calculated, included in "All other financial guarantees."
Note: All figures are direct premiums written.
Source: Surety Association of America

by the insurer that creates the market for financial guarantees.

The interest savings associated with financial guarantees can be substantial. In 1983, for example, a Louisiana agency issued a student loan bond. Part of the issue was insured by Fireman's Fund Insurance Company, received a AAA rating and yielded 7 percent.[4] The remainder of the issue was backed by surplus revenue, received an A rating and was priced at 7.4 percent.[5] Such differences in yields translate into significant dollar savings. In 1985, the South Carolina Public Service Authority saved an estimated $2.4 million in interest costs over the life of a $135 million ten-year electric revenue bond when it raised the bonds' rating from A to AAA with a guarantee from the Municipal Bond Insurance Association.[6]

The demand for financial guarantees is based upon the value of these credit enhancement services. A typical security is composed of a series of coupon payments and a principal payment that is due when the security matures. A financial guarantee lowers the security issuer's cost of borrowing. If bonds are assumed to sell at par and the yield curve is flat, then this reduction can be thought of as a reduction in the required coupon rate. The difference between the coupon rate on an insured and uninsured bond is the quality spread associated with that bond. The quality spread reflects the compensation that investors require to assume the additional risk associated with an uninsured security. Clearly, then, the higher a security's perceived market risk, the larger its quality spread and the greater the reduction in coupon payments associated with a financial guarantee. Borrowers with high perceived credit risk thus realize large interest cost savings and place the greatest value on a financial guarantee.

Just as the demand decisions of security issuers involve comparing interest cost savings to the financial guarantee premium paid, the supply decisions of insurers involve comparing the expected losses from a financial guarantee with the premium received. Recall the central assumption of the model that financial guarantee insurers are able to discover the true credit risk of individual security issuers. Since insurers know the true probability of default, they can make an accurate calculation of the expected losses associated with any particular guarantee. The fact that they are able to distinguish among borrowers of different risk types means that there will be a separate financial guarantee market for each true risk class. That is, insurers are able to obtain information about the riskiness of individual borrowers that allows them to offer a different schedule of premiums to borrowers of different risk types.

If it is costly to obtain credit information, then the supply decision of insurers will also incorporate information costs. Assuming that expected losses per dollar of bond principal insured are the same within a risk class, then insurers for whom information costs are low will be willing to write guarantees at lower premium rates than insurers for whom information costs are high. Within a risk class, then, the upward slope of the supply curve is determined by the distribution of information costs among insurers.

Within a risk class, the supply of financial guarantees is determined by the true default probability and the demand for financial guarantees is determined by the perceived default probability. This aspect of the model highlights the importance of information about credit risk in the financial guarantee market. In fact, in this analytic framework, only borrowers whose perceived credit risk is greater than their true credit risk will purchase a guarantee. This result highlights the importance of insurers' ability to obtain superior credit information as an essential element underlying the market for financial guarantees.

The equilibrium price and quantity of financial guarantee insurance are determined by the intersection of the supply and demand curves in each risk class (Chart 1). If the volume of financing is exogenous to the model, then the equilibrium quantity of financial guarantees can also be interpreted as the share of financing insured.

Both the equilibrium premium rate and the share of financing insured in each risk class are affected by the characteristics of borrowers and insurers in that risk class. For instance, if the distribution of perceived credit risk around the true degree of credit risk is the same across risk classes, then the equilibrium price of a guarantee will be higher in riskier credit classes. In this case, average interest cost savings increase with the degree of true credit risk, a result which implies that demand increases. At the same time, since the

[4]Two major credit rating agencies, Moody's and Standard & Poor's, assess the credit risk of various debt obligations and assign ratings based on these assessments. Municipal and corporate bonds, for instance, are rated from AAA ("extremely strong") to CC ("highly speculative"), with bonds rated BBB and above considered to be of "investment grade." The two agencies have slightly different symbols for their rating levels, but the investment grade categories are analogous:

| S&P | Moody's | Credit Evaluation |
|---|---|---|
| AAA | Aaa | extremely strong |
| AA | Aa | very strong |
| A | A | strong |
| BBB | Baa | adequate |

[5]*The Bond Buyer*, November 17, 1983.

[6]John W. Rindlaub, "Municipal Bond Insurance" in *Financial Guarantee Insurance* (Insurance Information Institute, New York, 1986), page 15.

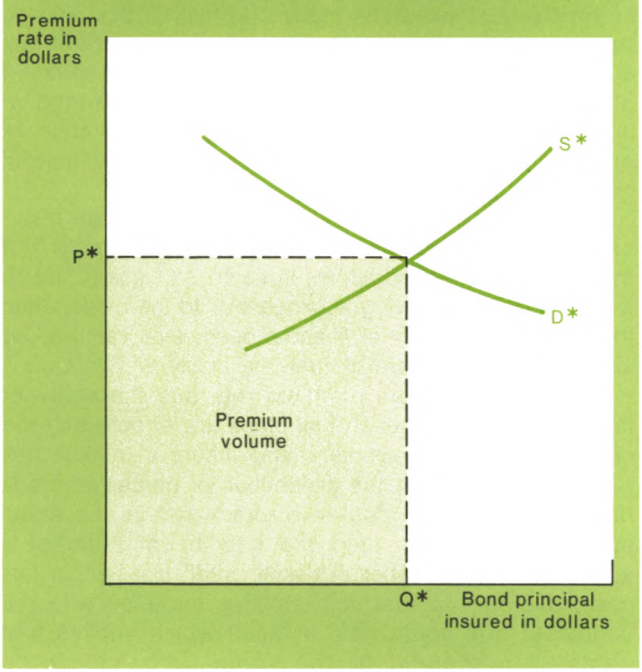
expected loss per dollar of insured principal increases with the degree of credit risk, the supply of financial guarantees decreases as the credit class becomes riskier. Increasing demand and decreasing supply therefore imply an increase in the equilibrium price and an indeterminant change in the equilibrium quantity of financial guarantees as the true degree of credit risk increases. Similarly, when the costs of obtaining credit information increase, the equilibrium price of financial guarantee coverage increases and the equilibrium quantity declines.

The equilibrium quantity and price of financial guarantees are also affected by the level of interest rates. In fact, the effects of interest rates on the supply and demand for financial guarantees shape the cyclical nature of the financial guarantee market. Interest rates affect demand by altering the value of interest cost savings realized by borrowers and affect supply by altering the expected financial guarantee losses of insurers.

The demand curve for financial guarantees is influenced by the factors that determine the value of a credit upgrade. Within a risk class, the level of interest rates affects the position of the demand curve by changing the value of interest cost savings. The direction of the effect of a change in interest rates on the value of a credit upgrade is not clear, however. On the one hand, there is an observed tendency for quality spreads to increase with the level of interest rates.[7] The result of this correlation is that interest cost savings tend to rise when interest rates are high. This tendency is offset, however, by the fact that higher interest rates reduce the present value of the future stream of coupon payment reductions. That is, holding the quality spread fixed, an increase in interest rates reduces the present value of the periodic interest cost savings because the opportunity cost of money is greater.

Chart 1

**The Financial Guarantee Market**




An increase in interest rates thus has two opposing effects on the value of interest cost savings: coupon payment reductions increase but are discounted over time at a higher rate. The sign of the net change in the value of interest cost savings thus cannot be determined a priori. Instead, the direction of change depends upon the relative magnitude of the two interest rate effects. If the increase in quality spreads is large enough to offset the effects of discounting at a higher rate, then the value of a credit upgrade will increase when interest rates rise. If the reduction in coupon payments is not sufficiently large, then interest cost savings will decline.

Which of these two effects dominates is an empirical question. In fact, it is quite possible that an increase in interest rates will raise interest cost savings at some times and lower them at others. Chart 2 plots the average ten-year Treasury bond yield against the implied interest cost savings on a 20-year municipal bond resulting from an upgrade from a BBB rating to a AAA rating. Although the interest cost savings measure is considerably more volatile than the Treasury bond yield, the two variables trend together. Average interest cost savings and Treasury bond yields increased from 1978 to a peak during 1981 and 1982. The two measures declined from that peak through the first quarter of 1987, despite diverging during 1984. Although during some periods the interest cost savings measure and the Treasury bond yield move in opposite directions, the overall movement of the two series is positively correlated.[8]

If the value of interest cost savings rises with the level of interest rates, then the demand for financial guarantees will also increase with the level of interest rates. That is, if an increase in interest rates raises the value

[7]One explanation for this correlation is that when interest rates increase, credit becomes scarce and lower quality bonds become significantly less liquid than higher quality bonds. Investors therefore require a differentially higher yield on lower quality bonds when interest rates are high.

[8]The correlation coefficient of the monthly interest cost savings and Treasury bill yield series is .20 for the period January 1978 to March 1987.

of a credit upgrade, then more borrowers will be willing to purchase a financial guarantee at any given premium rate. If the volume of financing is fixed, then the demand curve for financial guarantees will shift to the right when interest rates rise and shift to the left when rates fall. This pattern suggests that demand for financial guarantees moves pro-cyclically with changes in interest rates.

The supply of financial guarantees is also affected by the interest rate cycle. Like other insurance liabilities, a financial guarantee is a future claim on the insurer. In return for this future claim, the insurer receives a premium payment at the time that the policy is written. When interest rates are high, the premium payment required to offset this liability falls because interest income accrues more rapidly over the life of the guarantee. To cover the same volume of future claims, then, the insurer is able to charge lower premiums when interest rates are high. The supply of financial guarantees thus increases when interest rates rise and decreases when interest rates fall.[9]

The effect of changing interest rates on supply may be even greater for financial guarantees than for other insurance lines. Changes in the level of nominal interest rates are often due to changes in the expected rate of inflation. Most property/casualty lines insure against events such as auto accidents and malpractice findings. For this type of insurance, the dollar size of claims tends to rise and fall with the general price level, and insurers' loss reserve policies normally take this into account. For many types of financial guarantees, however, potential claims are fixed in nominal terms. Holding the probability of default fixed, financial guarantee insurers' expected losses do not move with expected inflation.[10] A contraction in investment income is not offset by a corresponding reduction in loss liabilities when nominal interest rates fall. The cyclical effects of interest rates are not damped by inflation-induced changes in liabilities, causing the supply of financial guarantees to be more sensitive to nominal interest rate fluctuations than other types of property/casualty insurance.

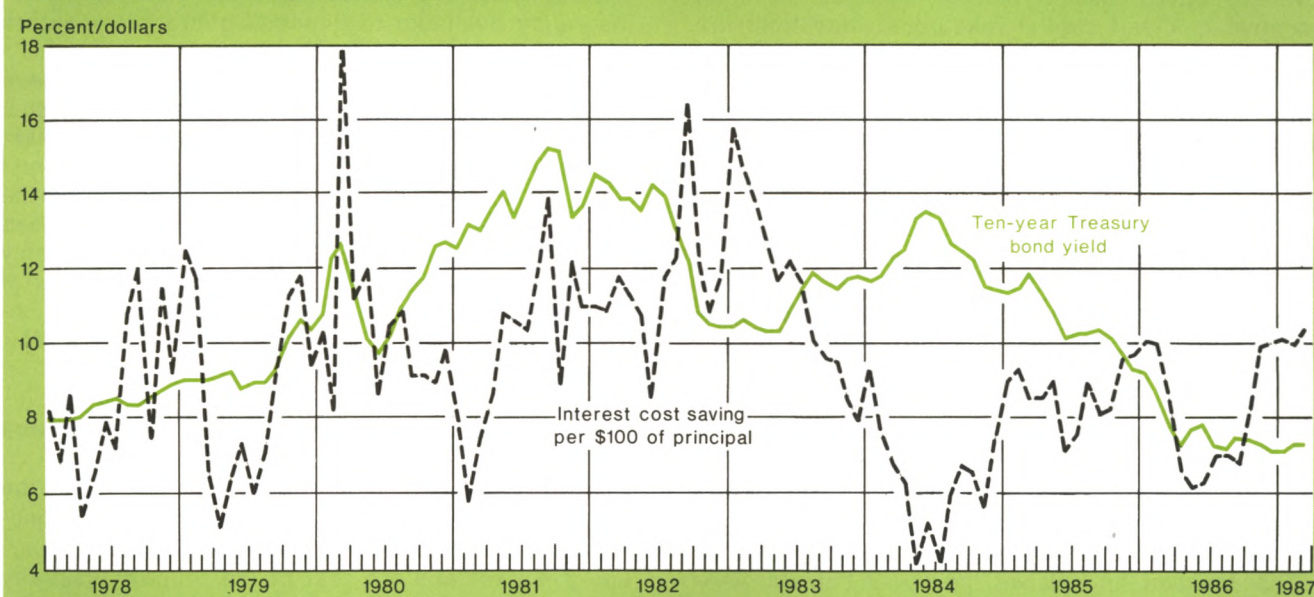
This description of the supply and demand for financial guarantees suggests that the financial guarantee market moves cyclically with interest rates. When interest rates are high, both supply and demand

[9]See Robert T. McGee, "The Cycle in Property/Casualty Insurance," this *Quarterly Review* (August 1986) for a detailed discussion of the relationship between interest rates and the underwriting cycle.

[10]Of course, the movement of inflation is, in general, part of the cyclical behavior of the economy which may well affect default rates. Mortgage guarantee insurance, for instance, is susceptible to cyclical swings in default rates.

Chart 2

**Interest Cost Savings and Interest Rates**




Sources: Federal Reserve Board and Federal Reserve Bank of New York staff estimates.

increase and the share of financing insured rises. When interest rates fall, on the other hand, both supply and demand contract and the equilibrium share of financing insured declines. The effect of interest rates on the price of financial guarantees is indeterminant, however, since changes in premium rates depend upon the relative size of movements in the supply and demand curves. This analysis suggests that the financial guarantee underwriting cycle is characterized by large swings in the equilibrium amount of insurance provided and by smaller adjustments in price. This combination implies that premium volume expands and contracts sharply over the underwriting cycle.

The cyclicality of the financial guarantee market is reinforced by its relationship with the rest of the property/casualty insurance industry. Many financial guarantee insurers are divisions or subsidiaries of larger property/casualty insurers. Like financial guarantee insurers, these property/casualty insurers realize higher investment income when interest rates are high and therefore reduce premiums during high interest rate periods. Since the demand for most types of property/casualty insurance is not affected by the level of interest rates, however, the premium cutting induced by an increase in interest rates undercuts property/casualty profitability. High interest rate environments tend to be profitable for financial guarantee insurers, however, since strong demand during these periods assures that competitive pressures to reduce premium rates and weaken underwriting standards do not become too severe. Property/casualty insurers therefore have an incentive to divert capital resources away from the overly competitive property/casualty market and into financial guarantees when interest rates are high. This inflow of capital augments the increase in financial guarantee supply that occurs when interest rates increase, reinforcing the interest rate driven cyclical nature of the market.

**The financial guarantee market in the 1980s**

This framework is useful for examining the experience of the financial guarantee market in the 1980s. In the early 1980s, both interest rates and quality spreads reached a cyclical peak, and financial guarantee premium volume began to increase rapidly (Table 3). This premium growth is consistent with the upswing of the financial guarantee underwriting cycle, as high interest rates and quality spreads caused both supply and demand to increase. Since 1982, however, both interest rates and quality spreads have declined. In the municipal bond market, for instance, the spread between AAA-rated and lower investment grade bonds has decreased substantially (Table 4). The BBB-AAA spread declined from a high of 160 basis points in 1982 to 81 basis points in 1986. The yield on AAA-rated municipal bonds also fell, declining from a high of 10.88 percent in 1982 to 6.13 percent in the first quarter of 1987. Although quality spreads widened slightly at the beginning of 1987, this cyclical decrease in yields and spreads signals the downswing of the underwriting cycle.

The effect of these declining interest rates and quality spreads is evident in data from the municipal bond market. The total face value of municipal bonds backed by a financial guarantee fell from $47 billion in 1985 to $26 billion in 1986, a drop of 44 percent (Table 5). The share of municipal bonds insured dropped less sharply, however, since the volume of new municipal bonds issued declined from $204 billion in 1985 to $140 billion in 1986. In 1985, financial guarantees backed 23 percent of all new municipal bonds issued, as opposed to 19 percent in 1986. The share of insured bonds rose to 23.6 percent in the first quarter of 1987, although the volume of insured bonds is approximately the same as the 1986 volume at an annual rate.

Several factors aside from interest rates influenced this growth and subsequent contraction of the financial guarantee market during the 1980s. The increase in demand for credit enhancement services following the Washington Public Power Supply System (WPPSS) default led to the continued expansion of the financial guarantee market. The severity of the most recent property/casualty underwriting cycle also promoted capital investment in the financial guarantee market and helped to sustain supply even in the face of declining interest rates. The limited amount of high quality reinsurance available to financial guarantee insurers constrained this expansion, however.

In the most recent financial guarantee cycle, these idiosyncratic factors were dominant. When interest rates and quality spreads were rising, these noncyclical factors reinforced the upswing of the cycle. When interest rates and spreads fell, however, these factors offset the tendency for contraction in the market and sustained the growth of both supply and demand. It was only when interest rates leveled in 1986 that the influx of capital and the increase in demand for credit enhancement were less able to sustain growth in the market.

**Relationship to the property/casualty insurance industry**

One of the most important factors accounting for the sustained growth in premium volume through the mid-1980s was the relationship between the financial guarantee market and the rest of the property/casualty industry. Financial guarantee insurance is provided by two types of insurers: monoline firms, which limit their business to financial guarantees, and multiline firms,

which are involved in several different insurance lines. In a multiline firm, financial guarantees are one of many products which have a claim on the firms' capital and reserves.

The interest rate driven property/casualty insurance cycle has had a direct impact on the financial guarantee market. In the early 1980s, the property/casualty market experienced a sharp decline in underwriting profits as a result of competitive pressure to drop premium rates. This decline in profitability in traditional property/casualty lines provided incentive for insurers to divert capital to the increasingly profitable financial guarantee market in the early 1980s. Between 1981 and 1985, 14 new major insurers entered the financial guarantee market.[11] While some of the investors in these new entrants were from outside of the insurance industry, major multiline property/casualty insurers such as Crum & Forster, Continental Insurance, Fireman's Fund, Traveler's Indemnity, and USF & G devoted capital and resources to writing financial guarantee insurance.

[11]Rindlaub, *op. cit.* page 12.

Table 4

**Interest Rates and Quality Spreads Municipal Bonds**

| | Ten-Year Treasury Bond Yield | AAA Municipal Bond Yield | Quality Spreads AA-AAA | A-AAA | BBB-AAA |
|---|---|---|---|---|---|
| 1980 | 11.46 | 7.85 | .22 | .60 | 1.16 |
| 1981 | 13.91 | 10.42 | .46 | .89 | 1.33 |
| 1982 | 13.00 | 10.88 | .43 | .97 | 1.60 |
| 1983 | 11.10 | 8.80 | .40 | .84 | 1.37 |
| 1984 | 12.44 | 9.61 | .27 | .55 | .77 |
| 1985 | 10.62 | 8.60 | .33 | .59 | .99 |
| 1986 | 7.68 | 6.95 | .21 | .48 | .81 |
| 1987-I | 7.19 | 6.13 | .15 | .60 | .97 |

Source: Moody's Investors Service, *Municipal and Government Manual*

Table 5

**Municipal Bond Insurance**

| | New Long-Term Issues (Billions of Dollars) | Insured Issues (Billions of Dollars) | Percent Insured |
|---|---|---|---|
| 1980 | 47.1 | 1.4 | 3.0 |
| 1981 | 46.1 | 2.9 | 6.5 |
| 1982 | 77.2 | 7.6 | 9.8 |
| 1983 | 83.3 | 12.1 | 14.5 |
| 1984 | 101.9 | 20.9 | 20.5 |
| 1985 | 204.0 | 46.9 | 23.0 |
| 1986 | 140.0 | 26.2 | 19.0 |
| 1987-I | 28.2 | 6.6 | 23.6 |

Source: New Issues: *Credit Markets*
Insured Issues: Financial Security Assurance, Inc. Comments before the S.E.C. (March 16, 1987)

The initial influence of the property/casualty underwriting cycle on the financial guarantee market was thus to expand the amount of capital available to underwrite financial guarantees. This substantial capital influx caused a large increase in the supply of financial guarantees in the early 1980s.

In the mid-1980s, the influx of capital from multiline insurers began to slow. Commercial property/casualty lines experienced losses that forced some multiline insurers to allocate strained capital resources away from financial guarantees. An example of this is Industrial Indemnity Financial Corporation, a corporate debt insurer, which was closed early in 1986 by its parent organization, Crum & Forster, when that unit decided to allocate its capital to other insurance lines.[12] Along similar lines, USF & G, a multiline municipal bond insurer, had its rating of insured bonds dropped from AAA to AA because it suffered losses in the casualty business.[13] The drop in rating reduced USF & G's ability to write municipal bond guarantees even though it had experienced no significant losses in this line.

This outflow of capital from multiline insurers was offset to a large degree by the formation of several monoline financial guarantee insurers in 1985 and 1986. These new monoline insurers include at least one AAA-rated municipal bond insurer (Capital Guarantee Investment Corporation) and two corporate financial guarantee insurers (Financial Security Assurance and Dryden Guaranty Trust). Although the municipal bond insurer, CGIC, is a reorganization of USF & G's previous financial guarantee subsidiary, much of the remaining investment in monoline insurers represents new capital in the market. This continued investment in the municipal bond and corporate financial guarantee sectors offset the withdrawal of multiline insurers from the business and did much to sustain supply through 1986.

## Reinsurance

Although investment in primary capital has been maintained in at least the major financial guarantee product markets, these markets have been somewhat constrained by a shortage of high-quality reinsurance capital. As in other lines of insurance, reinsurance in the financial guarantee market spreads the risk of any particular guarantee among several insurers. The issuer of a financial guarantee (the ceding company) may transfer

[12]*American Banker,* January 22, 1986.

[13]John W. Milligan, "A One-Man Assault on the Municipal Guarantee Business," *Institutional Investor,* June 1986, page 242.

some part of the liabilities of that guarantee to another insurer (the reinsurer). This reinsurer may be a monoline insurer that writes only reinsurance or a financial guarantee insurer that writes both primary financial guarantees and reinsurance on financial guarantees. In any case, the ceding company pays the reinsurer a premium for the reinsurance policy. The reinsurance premium is in general a proportion of the premium received for the financial guarantee by the ceding company minus commission expenses.[14]

The demand for financial guarantee reinsurance has strained the capacity of the relatively few high quality reinsurers. The limited number of reinsurers has been further curtailed in reinsuring financial guarantees by losses in property/casualty lines which have reduced overall capacity. This contraction of capacity has been offset to some degree by the entry of two monoline municipal bond reinsurers, U.S. Capital Reinsurance Company and Enhance Reinsurance Company. Both insurers have approximately $100 million in capital. Enhance is rated AAA by Standard & Poor's.

The exact extent of reinsurance in the financial guarantee market is difficult to measure. A rough measure of the amount of reinsurance of all surety bonds is contained in Table 6. Direct written premiums include all premiums received by an insurer for financial guarantee business and for any reinsurance assumed from other insurers. Net written premiums equal these direct premiums minus any reinsurance ceded to other insurers. The difference between direct and net premiums is thus net reinsurance premiums: the premiums paid for reinsurance ceded minus the premiums received for reinsurance assumed. Net reinsurance premiums measure the amount of reinsurance assumed by reinsurers who are not primarily financial guarantee insurers. As a fraction of direct premiums, reinsurance reached a peak of 19.4 percent in 1984 before falling off to just 8.4 percent in 1985. Because only data on net premiums are available, it is impossible to tell whether this decline is a result of an absolute reduction of reinsurance activity or whether it reflects a shift in the placement of reinsurance away from monoline reinsurers and towards other financial guarantee insurers. Given the acknowledged strain on reinsurance capacity, however, some real reduction in reinsurance activity is probably indicated by these data. Such a reduction implies a further constraint on the supply of financial guarantees.

### Demand for credit enhancement

The final factor responsible for the growth of the financial guarantee market was an increase in the general demand for credit enhancement services. This increase in demand was largely a result of the 1983 WPPSS default. In 1983, WPPSS defaulted on $2.25 billion in municipal revenue bonds issued to fund construction of two nuclear power plants. Over 78,000 bondholders were affected by the default, which received wide publicity. One of the outcomes of the WPPSS default was an increased investor concern about credit risk and a shift in preferences towards high-quality debt. The demand for credit enhancement services increased as part of this preference shift. The financial guarantee market was particularly affected since a portion of the WPPSS bonds was insured by the American Municipal Bond Assurance Corporation (AMBAC). AMBAC assumed responsibility for interest and principal payments on the $23.6 million of WPPSS bonds it had insured. The WPPSS default and AMBAC's response brought about an increase in demand for credit enhancement, which helped to sustain demand for financial guarantees even as quality spreads narrowed.

The increase in the demand for credit enhancement services was also a result of innovations in securities markets which increased the importance of structured financings and asset securitization. The structure of these securities is more complicated than traditional debt financings. For this reason, obtaining credit information and making an assessment of the default risk of these securities is often difficult. The credit analysis associated with a credit-enhanced security, however, reduces to obtaining information about the credit enhancer and the nature of the guarantee rather than analyzing the entire structure of the underlying security.

Table 6

**Reinsurance Of Surety (in thousands of dollars)**

| | Direct Premiums Written | Net Premiums Written | Reinsurance Premiums Ceded – Reinsurance Premiums Assumed | Percent Of DPW |
|---|---|---|---|---|
| 1981 | 1,112,925 | 970,498 | 142,427 | 12.8 |
| 1982 | 1,247,829 | 1,094,117 | 153,712 | 12.3 |
| 1983 | 1,512,741 | 1,272,198 | 240,543 | 15.9 |
| 1984 | 1,941,130 | 1,564,934 | 376,196 | 19.4 |
| 1985 | 2,473,103 | 2,264,435 | 208,668 | 8.4 |

Note: Premium data include all business done by companies based in the United States

Direct Written Premiums = financial guarantee premiums + reinsurance assumed premiums

Net Written Premiums = Direct Written Premiums – reinsurance ceded premiums

Source: A.M. Best's Executive Data Services

[14]Michael R. Pinter, "The Reinsurance of Financial Guarantee Insurance" in *Financial Guarantee Insurance* (Insurance Information Institute, New York, 1986), pages 54-56.

Because of this simplified information requirement, credit enhancement enables borrowers to have greater access to public debt markets. In fact, many of these financings would not be feasible were it not for the ability of a credit enhancer to provide concise credit information to the market. The use of financial guarantees in these relatively complicated structured financings has greatly increased demand in the corporate financial guarantee sector.

**Competition from commercial banks**

Financial guarantee insurers' primary competitors in the market for credit enhancement services are commercial banks. Commercial banks compete with financial guarantee insurers in the credit enhancement market through Standby Letters of Credit (SLCs). A credit-enhancing SLC is similar to a financial guarantee in that the bank agrees to provide funds for interest and principal payments on a backed security in the event that the security issuer defaults. SLCs differ from financial guarantees in that they have a fixed expiration date that does not necessarily correspond to the maturity of the backed security. Although commercial bank SLCs are issued to cover a variety of bank customer activities, they are used in the credit enhancement market primarily to back commercial paper and tax-exempt industrial revenue bonds.

The overall use of SLCs has grown rapidly in the 1980s. Total outstanding SLCs were approximately $250 billion at the end of 1986, up from just $50 billion in 1980. Both domestic and foreign commercial banks participate in this market. In 1986, $453 million (5 percent) of tax-exempt housing bonds issued were backed by SLCs, predominantly from domestic banks. Approximately 14 percent of tax-exempt hospital bonds were backed by SLCs, nearly three-quarters of which were issued by foreign banks. Foreign bank SLCs also dominated the market for enhancement of pollution control bonds. Japanese and Swiss banks are particularly active in this area.[15]

Table 7

**Credit Enhancement in the Municipal Bond Market**

| | Face Value of Bonds Insured | | | | | |
|---|---|---|---|---|---|---|
| | 1984 | | 1985 | | 1986 | |
| | Millions of Dollars | Percent | Millions of Dollars | Percent | Millions of Dollars | Percent |
| Domestic Banks | 11,418 | 32.7 | 12,113 | 14.9 | 4,637 | 10.7 |
| Foreign Banks | 6,959 | 19.9 | 25,043 | 30.9 | 10,530 | 24.3 |
| Insurers | 16,551 | 47.4 | 43,979 | 54.2 | 28,125 | 65.0 |
| Total | 34,928 | | 81,135 | | 43,292 | |

Source: Financial Security Assurance, Inc. Comments before the Security & Exchange Commission, March 16, 1987

As with financial guarantees, securities backed by SLCs receive a credit rating based upon the issuing bank's credit rating. Since very few domestic banks receive a AAA rating, SLCs from most domestic banks are at a competitive disadvantage to the relatively large number of AAA-rated financial guarantee insurers. This disadvantage is particularly acute in the municipal bond enhancement market. Domestic bank letters of credit accounted for only 10.7 percent of credit enhancement in the municipal bond market in 1986, down from 32.7 percent in 1984 (Table 7). On the other hand, commercial bank SLCs have a competitive advantage in the corporate credit enhancement market. Corporate securities backed by SLCs from domestic banks and the domestic branches of foreign banks are exempt from SEC registration requirements. Similar securities backed by financial guarantees do not qualify for this exemption. Financial guarantee insurers claim that this disparity places them at a competitive disadvantage in the corporate market and are petitioning the SEC to extend the registration exemption to securities backed by AAA-rated financial guarantees. This situation does not affect enhancement of municipal bonds since all municipal bonds are exempt from registration requirements.

There is at least one important respect in which financial guarantees and SLCs are complementary products. In many instances, insurers will require as part of the financial guarantee contract that security issuers obtain an SLC to absorb some part of the credit risk. In these cases, the bank issuing the SLC assumes the risk that the issuer will default, and the financial guarantee in turn stands behind the bank and thus serves mainly to give the guaranteed security a AAA rating. This structured credit enhancement is particularly prevalent in the corporate financial guarantee market, although it also occurs with municipal bond insurance.

Commercial banks are also involved in the financial guarantee market through equity investments in financial guarantee insurers. Citibank, Bankers Trust and J.P. Morgan have each become major investors in AAA-rated municipal bond insurers (AMBAC, BIG and FGIC, respectively). This investment gives these banks a share of the credit enhancement market for municipal bonds, in which most domestic commercial banks are at a competitive disadvantage.

**Segmentation in the financial guarantee market**

The financial guarantee market is segmented both by product and by type of insurer. Financial guarantee insurers fall into one of two groups. The first group

[15] *Credit Markets*, February 23, 1987; March 9, 1987; March 16, 1987.

includes major insurers such as the American Municipal Bond Insurance Corporation (AMBAC), the Municipal Bond Investor's Assurance Corporation (MBIA) and Financial Security Assurance Inc. (FSA) that have received a AAA claims paying ability rating from Standard & Poor's and/or Moody's. The second tier of the market is composed of various small non-AAA-rated insurers. The major insurers are recognized by state regulators and their actions are closely monitored by the rating agencies. Some of these firms are monoline insurers that are large participants in mature product lines such as municipal bond insurance (AMBAC, Bond Investors Guarantee Insurance, Financial Guarantee Insurance Company) and corporate financial guarantees (FSA). Others are large multiline property/casualty firms that have entered these mature markets or are innovating new financial guarantee products (Prudential, Continental, and until 1987, MBIA).

Firms in the second tier market, on the other hand, are not rated by the two major credit rating agencies, although they often receive a rating from the insurance rating firm, A. M. Best Company. These insurers are for the most part smaller multiline insurers that underwrite a variety of products in addition to financial guarantees. As such, their financial guarantee activity is not always discernible in financial statements and in reports to regulators and professional associations. Financial guarantees are most commonly included as part of surety business and occasionally reported in categories such as miscellaneous casualty.

The end result of this reporting procedure is that the activities of the second tier market are difficult to quantify. Participants in this segment of the market are often not known to regulators and professional associations until they are involved in some sort of default or failure. Since these firms are not rated by Moody's and Standard & Poor's, they for the most part do not perform the same type of credit enhancement offered by the major insurers. Instead, these smaller insurers write products such as mortgage-backed bond guarantees, limited partnership insurance and smaller corporate credit underwriting for small borrowers and businesses.

**Municipal bond insurance market**

The financial guarantee market is also segmented by type of product. One of the best understood financial guarantee products is municipal bond insurance. The first monoline municipal bond insurance company, AMBAC, opened in 1971 and was joined in 1974 by MBIA. Until the early 1980s, these two firms were the primary providers of municipal bond insurance. In the early 1980s, however, both the number of insurers writing municipal bond guarantees and the percent of municipal bonds insured grew significantly. In 1985, nine major AAA-rated firms were engaged in writing municipal bond guarantees for an estimated 23 percent of the $204 billion of new municipal bond issues, up from 3 percent in 1980 and 9.8 percent in 1982. In 1986, however, that percentage fell to 19 percent of the $140 billion of new issues (Table 5). According to the Surety Association of America, municipal bond insurance generated $150 million in premiums in 1984 and $124 million in 1985, as opposed to only $13 million in 1980 (Table 2). The total value of insured municipal bonds outstanding was estimated to be $250 billion at the end of 1986, up from $28 billion in 1975.

The major municipal bond insurers limit their coverage to bonds which are of investment grade on their own merit. For bonds at the lower end of the investment grade classification, insurers may require additional credit security. For instance, the issuing municipality might be required to create a reserve fund equal to one year's interest payments on the bond. Such a fund both reduces the insurer's loss exposure and provides a grace period for the issuer and insurer to restructure in the event of a default. In other cases, the issuing municipality might purchase a bank standby letter of credit to absorb all or part of the primary credit risk. In some instances, the letter of credit is used to raise the bond to investment grade and make it eligible to receive a financial guarantee.

The first major firm to offer financial guarantee insurance was AMBAC. Founded in 1971, AMBAC is now owned primarily by Citibank and an association of AMBAC employees. AMBAC insures a wide range of municipal bonds and related securities, including general obligation and revenue bonds, industrial revenue bonds, individual bond portfolios, municipal bond portfolios, unit investment trusts and hospital bonds. AMBAC is a monoline insurer with capital of $245 million.[16] AMBAC insures only investment grade securities and all issues insured by AMBAC receive a AAA rating from Standard & Poor's.

The second major municipal bond insurer is MBIA. MBIA was founded in 1974 as an association of multiline property/casualty insurers, but in January 1987 became an independent monoline firm with $420 million in capital. MBIA's four investors are: Aetna Casualty and Surety (48 percent); Fireman's Fund Insurance (25 percent); CIGNA (17 percent); and Continental Insurance (10 percent). All issues insured by MBIA receive a AAA rating from both Moody's and Standard & Poor's.

Two other municipal bond insurers also receive AAA ratings from both Moody's and Standard & Poor's. Financial Guarantee Insurance Company (FGIC) was

[16] *Credit Markets*, January 8, 1987.

founded in 1983 with capital from five investors: Shearson Lehman/American Express, Merrill Lynch, General Electric Credit Corporation, Kemper Corporation and General Reinsurance Corporation. FGIC is a monoline insurer with $334 million in capital.[17] The founder of FGIC, Gerald Friedman, was also a founder of AMBAC.

The Bond Investor's Guarantee Insurance (BIG) company is the third firm to receive the "double triple" rating. Founded in 1984, BIG is owned by American International Group, Inc., Bankers Trust New York Corp., Government Employees Insurance Co., Salomon Inc., and Xerox Credit Corp. BIG is a monoline insurer with capital resources of $124 million.[18]

Participation in this market by other major, AAA-rated firms has been marginal. In October 1986, however, a fifth monoline municipal bond insurer, Capital Guaranty Insurance Corporation, began operations in San Francisco. CGIC is an offshoot of USF & G and will assume the municipal bond guarantee business performed by USF & G's financial guarantee subsidiary. CGIC has an initial capitalization of $100 million from six investors, including Constellation Investments, Fleet Financial Group, Norstar Bancorp, Safeco Corporation, Sibag Financial and USF & G.

Together AMBAC, MBIA, FGIC and BIG accounted for over 95 percent of municipal bond insurance written in 1985 and 1986 (Table 8). The share of insured volume written by these firms in the first quarter of 1987 appears to have remained at this level. However, 1985 may have been a peak year for this line of business.

[17] *Credit Markets*, December 8, 1986.

[18] *Credit Marklets*, September 8, 1986.

Table 8

**Major Municipal Bond Insurers**

| | Share Of Total Insured Municipal Bonds (Percent) | | | Net Premiums Written (Millions of Dollars) | |
|---|---|---|---|---|---|
| | 1985 | 1986 | 1987-I | 1984 | 1985 |
| MBIA* | 31.5 | 35.9 | 37.6 | 141.3 | 167.9 |
| FGIC | 28.1 | 28.5 | 25.1 | 45.2 | 168.4 |
| AMBAC† | 28.3 | 24.5 | 12.2 | N/A§ | 134.1 |
| BIG‡ | 5.9 | 8.3 | 24.4 | N/A | 60.9 |

*Premium data for MBIA are for year ending November 30.
†Premium data for AMBAC are for following year ending June 30.
‡BIG's first year of operation was 1985.
§Not Available
Source: Premium data: *Business Insurance* October 20, 1986.
Distribution data: Securities Data Company, Inc.

The volume of new municipal bonds issued reached only $140 billion in 1986, and the dollar volume of insured issues fell to $26.2 billion from $46.9 billion in 1985. It appears that dollar volume remained at this lower level in the first quarter of 1987, with new insured volume running at a $26.6 billion annual rate.

This decline in the volume of municipal bond issues insured can be attributed in part to a weakening of demand for municipal bond guarantees. The spreads between AAA-rated and lower investment grade municipal bonds fell by approximately 20 percent from 1985 and 50 percent from 1982 (Table 4), reducing the value of a credit upgrade and undercutting the demand for municipal bond insurance. In addition, changes in the federal tax code that repeal tax exempt status for some categories of revenue bonds and place a cap on total tax exempt issues for private activity bonds are likely to reduce total demand for guarantees by reducing demand from this sector of the municipal bond market.

Municipal bond insurers are developing new products to compensate for the decline in demand for traditional municipal bond insurance. Several insurers are enlarging their activities in the taxable municipal bond market. Others are developing new applications for already existing financial guarantee products. For instance, AMBAC has recently begun to market a form of municipal liability insurance in conjunction with the insurance broker Alexander and Alexander. The product consists of a renewable line of credit issued by a local bank and insured by AMBAC. In the event that a liability claim forces the municipality to draw on the line of credit, AMBAC guarantees that the loan will be repaid. The line of credit may be from $2 million to $50 million.[19] Similarly, BIG has developed a program in which an insured letter of credit is substituted for the debt service reserve fund for municipal bonds insured by BIG. The substitution enables bond issuers to avoid the costs associated with the new tax law's arbitrage restrictions on reserve fund income.

The loss record for municipal bond insurers remained quite good through 1986 (Table 9). Since the market developed in the early 1970s, the only major loss suffered by these insurers has been the 1983 WPPSS default. AMBAC had insured $23.6 million of the $2.25 billion defaulted WPPSS bonds and is responsible for interest and principal payments on the bonds as long as they are in default. In addition, in September of 1986, AMBAC was forced to make interest payments on three Chattanooga, Tennessee industrial development bonds when the developer who had received the funds from the bonds defaulted on the September 1 payments. The face value of the bonds is $55 million, but the total

[19] *American Banker*, January 2, 1987.

extent of AMBAC's liability in this case is not yet clear.[20]

**Corporate financial guarantee market**

In contrast to the fairly uniform municipal bond insurance market, the corporate financial guarantee market is complex and diverse. The number of types of securities and transactions for which financial guarantees are written is large: commercial paper, limited partnerships, leases, receivables, mortgage-backed securities, consumer receivable backed securities and bank loans are examples of the type of corporate instruments secured by financial guarantees. Most corporate guarantees are heavily collateralized so that insurers have recourse to the assets underlying the debt in the event of default.

To date, there are relatively few monoline insurers of corporate obligations, although a number of the major AAA-rated multiline insurers write these sorts of guarantees. The degree of participation in the corporate market by non-AAA-rated insurers is uncertain, but the rapid rate of product innovation and premium growth in this market suggests that these smaller insurers are active in at least some product lines.

The dominant monoline participant in the corporate financial guarantee market is Financial Security Assurance, Inc. (FSA). Founded in 1985 with $188 million in capital invested by Ford Motor Credit, The Equitable, John Hancock, Transamerica and New England Mutual Life, FSA was the first monoline insurer of corporate debt.[21] FSA currently has 25 foreign and domestic investors and receives a AAA rating from both Moody's and Standard & Poor's, as well as from Nippon Investors Service, a Japanese credit rating agency.

FSA's primary products are guarantees on structured financings and securitized debt. Approximately 75 percent of FSA's guarantees are written for asset-based transactions such as commercial mortgage-backed securities and bank-backed obligations. FSA also specializes in guarantees of receivable-backed transactions such as credit card-backed debt and auto loan-backed debt.

Although FSA is the primary monoline AAA-rated insurer in the corporate guarantee market, several major multiline companies also write corporate financial insurance. Prudential, GEICO, Continental, AIG and CNA, among others, have units which have specialized in various segments of the corporate market. Financial Insurance Risk Management (FIRM), a subsidiary of GEICO, insures smaller, privately-placed transactions such as residual value insurance for lease contracts. FIRM also assumes some reinsurance from FSA. Continental Guaranty and Credit Corporation, a subsidiary of Continental Insurance, also insures small corporate transactions. In general, Continental Guaranty insures transactions of less than $10 million, raising unrated corporate securities to investment grade. Continental guarantees assets such as industrial development bonds, corporate debt, municipal leases and educational loans.

Unlike many corporate financial guarantee units, Dryden Guaranty Trust is a monoline subsidiary of Prudential. Dryden, which was formed in 1986, is in the process of applying for an independent credit rating. This monoline structure is designed both to protect Dryden from any change in Prudential's rating and to protect Prudential against any large losses suffered by Dryden. Dryden's primary product will be guarantees on commercial bank portfolios of unrated corporate debt. With such guarantees, banks will be able to market pools of these loans, much as mortgage guarantees permit mortgages to be pooled and securitized.

According to the SAA, the volume of direct premiums written for corporate financial guarantees was nearly $98 million in 1985 (Table 2). Losses in this line were

[20] *Credit Markets*, September 15, 1986.

Table 9

**Loss Rates By Financial Guarantee Product (in thousands of dollars)**

| | Direct Premiums Earned | Direct Losses Incurred | Loss Ratio (percent) |
|---|---|---|---|
| | Municipal Bond Guarantees | | |
| 1980 | 5,342 | 1,205 | 22.6 |
| 1981 | 10,150 | −15 | −.1 |
| 1982 | 21,009 | 636 | 3.0 |
| 1983 | 38,727 | 38,712 | 100.0 |
| 1984 | 55,626 | 5,938 | 10.7 |
| 1985 | 60,149 | −13,054 | −21.7 |
| | Commercial Investment & Loan Guarantees, Corporate Debt Credit Enhanced | | |
| 1984 | 165 | 0 | 0.0 |
| 1985 | 6,351 | 10,002 | 157.0 |
| | All Other Commerical Investment & Loan Guarantees | | |
| 1984 | 853 | 0 | 0.0 |
| 1985 | 6,669 | 11,876 | 178.1 |
| | All Other Financial Guarantees | | |
| 1980 | 11,978 | 983 | 8.2 |
| 1981 | 13,367 | 6,781 | 50.7 |
| 1982 | 17,187 | 10,935 | 63.6 |
| 1983 | 33,620 | 5,842 | 17.4 |
| 1984 | 70,006 | 18,632 | 26.6 |
| 1985 | 96,405 | 175,492 | 182.0 |

Source: Surety Association Of America

[21] Peter E. Hoey and Theodore V. Buerger, "Financial Guarantee Insurance," *Trusts and Estates* (Insurance Information Institute, New York, 1985).

severe in 1985, however (Table 9). The loss ratio (direct losses incurred as a percent of direct premiums earned) for commercial investment plus loan guarantees and corporate debt credit enhancement was 157.0 in 1985. For "all other" commercial investment, losses were even higher, representing 178 percent of premiums earned. This record is unlikely to have improved, as defaults of limited partnerships—categorized under "all other" commercial investment — have increased as a result of the fall in oil prices and changes in the tax code.

The changes in the tax code which eliminate the tax benefits of certain limited partnerships will sharply decrease demand for this type of insurance in the future. The Tax Reform Act of 1986 stipulates that only income from passive activities such as limited partnership investments in real estate and oil and gas drilling may be offset by losses from passive activities. Since many of these partnerships purchased guarantees on the bank loans that they assumed to fund investment, the elimination of most of the tax shelter benefits of these limited partnerships significantly reduces financial guarantee demand in this area. On the other hand, investor and borrower awareness of the value of financial guarantees in corporate transactions is certainly on the rise. Unlike the municipal bond insurance market, the corporate financial guarantee market continues to be supported by noncyclical factors which offset declining interest rates and quality spreads. The demand for corporate financial guarantees resulting from innovations in securitization and structured financings in both domestic and foreign capital markets is likely to sustain growth in this market even in the current low interest rate environment.

**Regulation**

One of the most important issues facing the financial guarantee market today is regulation. The primary concern of state insurance regulators in reference to financial guarantees is the integrity of the insurance guaranty funds. Guaranty funds have been established in every state in order to meet the obligations of insolvent property/casualty insurers. Although procedures vary from state to state, the basic structure is that solvent insurers in a state contribute to the fund on a proportional basis after a failure has occurred. Both regulators and insurers are therefore concerned about the effects that a large financial guarantee claim would have on a given guaranty fund. The total amount raised by guaranty funds in all 50 states between 1969 and 1984 was $528 million.[22] AMBAC's losses on the WPPSS bonds were $25.5 million in 1983 alone, nearly 5 percent of this total.[23] The magnitude of losses such as this has led to almost universal agreement among insurance regulators that the direct claims of financial guarantee policyholders should not be met from the state guarantee funds.

Instead, the regulators' concern is about the systemic effects of insolvencies due to financial guarantees. Under present regulations, property/casualty policyholders from insolvent multiline insurers have access to state guaranty funds regardless of the reason for the insurer's insolvency. A multiline firm that fails because of losses from financial guarantees would still represent a drain on guaranty fund resources even if financial guarantee policyholders had no access to the fund. It is this sort of resource drain that state agencies wish to prevent through regulation.

The most direct approach to attaining this goal has been proposed by the National Association of Insurance Commissioners (NAIC). The NAIC proposal is that financial guarantees be written only by monoline insurers. Proponents of this view argue that if the financial guarantee market is limited to monoline insurers, both the state guaranty funds and other property/casualty policyholders will be protected from the effects of large financial guarantee claims. In addition, the monoline structure permits direct monitoring of capital and reserve adequacy by regulators since all of the insurer's resources are devoted to financial guarantees.

Because the NAIC proposal imposes minimum capital requirements in addition to a monoline structure, it would effectively restrict the financial guarantee market to large insurers. New York State Superintendent of Insurance James Corcoran supports NAIC model legislation being considered by the New York State Assembly which would require that all new monoline financial guarantee insurers have at least $50 million in startup capital and surplus.[24]

Other regulators and industry participants dispute the need to limit the market to monoline insurers. Proponents of this view argue that the monoline restriction is unnecessary and disruptive. They contend that the requirement to dedicate capital for financial guarantees would serve to reduce capacity in other property/casualty lines since a large amount of capital would have to be diverted in order to form monoline subsidiaries. Finally, opponents of the NAIC proposal argue that requiring financial guarantees to be written by monoline firms would eliminate the benefits of diversification.[25]

[22] *1985-86 Property/Casualty Fact Book* (Insurance Information Institute, New York, 1985), page 41.

[23] W. James Lopp, Financial Security Assurance, Inc. Comments before the Securities and Exchange Commission on March 16, 1987.

[24] New York State Assembly Bill No. 11347.

[25] *American Insurance Association Statement of Position on Regulation of Financial Guarantee Insurance* (September 30, 1986), page 9.

Instead, the American Insurance Association and others contend that risk limitations and capital and reserve requirements are sufficient to prevent insolvencies and protect the guaranty funds. Such requirements are also a prominent feature of the NAIC model legislation. In essence, these regulations limit the exposure that insurers may assume from any one source and impose mandatory contributions to contingency reserve funds based on the type of security insured. In general, municipal bonds have the lowest reserve contribution requirements and unrated corporate securities have the highest.[26] In New York State, municipal bond insurers are already subject to reserve requirements which stipulate that one-half of earned premiums be reserved to cover losses. The legislation adopted by New York State is likely to become the standard for legislation elsewhere in the United States.

In terms of understanding and monitoring the financial guarantee market, the most important contribution of whatever legislation is adopted will be establishing a legal definition of financial guarantees. By defining which transactions constitute a financial guarantee and by requiring these transactions to be reported, the proposed regulations will serve to uncover the activities of the second tier financial guarantee market. The lasting effects of the legislation, however, will depend upon the ability of regulators and legislators to keep pace with the rate of product innovation by insurers and the investment community.

## Outlook

The future of the financial guarantee market will be shaped by this regulation as well as by other factors involving both cyclical and noncyclical influences. In the near term, the market is facing the downswing of the underwriting cycle, as interest rates and quality spreads have reached their lowest levels of the 1980s. The combination of low interest rate levels and narrow quality spreads means that the demand for financial guarantees has fallen just at the point that insurers face pressure to raise premiums to offset lower investment income. At current interest rate levels, then, the financial guarantee market is facing a period of contraction, with insurers caught between the need to raise premiums in order to be able to meet future liabilities and competitive pressures to accept lower premiums in order to generate new underwriting business.

The question that arises is whether insurers will be adequately compensated for the risk that they assume in writing financial guarantees in this low interest rate environment. This is the first time that the fully-developed financial guarantee market has experienced the downswing of the underwriting cycle. Competitive pressures in the market are likely to be more severe than in previous cyclical contractions because of the large number of insurers that entered the market during the underwriting cycle's expansion in the first half of the 1980s. The large number of insurers competing for the relatively small amount of financial guarantee business could place pressure on insurers to lower underwriting standards. With narrow quality spreads, only less creditworthy borrowers will realize significant interest cost savings through the purchase of a financial guarantee. The pool of "insurable" securities will therefore be composed of a larger percentage of these borrowers, and insurers will face pressure to guarantee these securities in order to sustain premium income. These pressures will be most severe for the most recent entrants in the market since these insurers have a smaller volume of outstanding business and therefore smaller unearned premium reserves.[27]

It remains to be seen whether underwriting standards will be maintained as the financial guarantee cycle runs its course. Loss ratios for some types of corporate guarantees are already quite high and a number of small insurers have failed as a result of their financial guarantees activities. This suggests that at least some financial guarantee insurers are vulnerable to a downturn in the underwriting cycle. Future losses in the market will be determined by the degree to which competition for underwriting business during this downturn affects the credit decisions made by financial guarantee underwriters.

[26]New York State Assembly bills Nos. 11347, 11348, 11349, (May 28, 1986).

[27]Although financial guarantee premiums are most generally paid in a lump sum at the time that the security is issued, they are "earned" in an accounting sense over the lifetime of the guarantee. For instance, a $1 million premium on a ten-year bond guarantee might be "earned" by the insurer in ten annual installments of $100,000. The remainder of the "unearned premium" is placed in a reserve fund. Insurers with a large volume of outstanding insured securities would thus be likely to have large unearned premium reserves and therefore a source of accounting income that could sustain them through a period of reduced current underwriting.

Beverly Hirtle

## Appendix: A Model of the Financial Guarantee Market

This appendix develops in detail the model of the financial guarantee market discussed in the text. The model stresses the importance of interest rates in determining the level of financial guarantee activity and emphasizes the role of information about credit risk in creating a market for financial guarantees. Comparative static results derived from the model are used to describe the cyclical nature of the financial guarantee underwriting cycle. Finally, the relationship between credit risk and the share of financing insured by financial guarantees is explored.

### Demand

To begin, it is assumed that there are N risky borrowers, each of whom wishes to borrow B dollars. Each bond issuer belongs to one of K risk classes, where a risk class is defined by the default probability of the borrowers in that class. In other words, each bond issuer in a given risk class k has default probability $p_k$. There are $N_k$ bond issuers in each class, where

$$\Sigma_k N_k = N$$

Each bond issuer knows his own risk class and "true" default probability, $p_k$, but the capital market does not know the borrower's true credit risk. Instead, the market receives a noisy signal of the default probability of each bond issuer, $p_n = p_k + \mu_{kn}$, where the index n designates a specific borrower. $\mu_k$ may vary by risk class and is distributed over the interval $[-p_k, 1-p_k]$ with continuous distribution function $g(\mu_k; p_k)$. The limits of the distribution are determined by the fact that the market's perceived default probability, $p_n$, is limited to the range [0,1].

The demand for financial guarantees is derived from the interest cost savings that the guarantee provides to the bond issuer. The model assumes that with a guarantee, the bond issuer can borrow at the risk free rate, r. Without the guarantee, however, the bond issuer can borrow at rate $\bar{r}_n$, where $\bar{r}_n = r + qs_n$. $qs_n$, the "quality spread", is assumed to be a function of the level of interest rates as represented by the risk free rate, r, and the market's perception of the borrower's credit risk, $p_n$. The quality spread is assumed to increase with the perceived level of credit risk ($\delta qs_n/\delta p_n > 0$) and with the level of interest rates ($\delta qs_n/\delta r > 0$). This second assumption reflects liquidity effects. When interest rates rise, credit becomes scarce and lower quality bonds become significantly less liquid than riskless debt. Investors therefore require a differentially higher yield on risky debt when interest rates rise.

This quality spread $qs_n$ represents the reduction in the bond issuer's cost of funds when he purchases a financial guarantee. To calculate an explicit expression for the total financing savings resulting from a guarantee, the following assumptions about the structure and characteristics of bonds and the capital market are made. First, the structure of all bonds in the market is assumed to be identical, with bonds having principal B, a fixed coupon rate $c_n$ and maturity T. The yield curve is assumed to be flat and all bonds are assumed to be structured so that they sell at par. These last assumptions imply that the coupon rate on each bond, $c_n$, is set to be equal to $\bar{r}_n$ if the bond is uninsured and r if the bond is insured. Under these assumptions, the reduction in coupon payments when a guarantee is purchased is

$$\bar{r}_n B - rB = qs_n B$$

This result can be used to calculate the total value of a guarantee to a bond issuer. This value, $V_n$, is the present value of all future interest cost savings:

$$V_n = \sum_{t=1}^{T} \frac{qs_n}{(1+\bar{r}_n)^t} = \frac{qs_n}{r+qs_n}\left[1 - (1+r+qs_n)^{-T}\right]$$

where, without loss of generality, B is set equal to 1. The uninsured borrowing rate $\bar{r}_n = r + qs_n$ is used to discount the flow of interest cost savings because this rate represents the borrower's opportunity cost of funds. Taking derivatives,

$$\frac{\delta V_n}{\delta qs_n} = \frac{qs_n}{r+qs_n}\left[T(1+r+qs_n)^{-(T+1)}\right] + \frac{r}{(r+qs_n)^2}\left[1 - (1+r+qs_n)^{-T}\right] > 0$$

$$\frac{\delta V_n}{\delta r} = \frac{qs_n}{r+qs_n}\left[T(1+r+qs_n)^{-(T+1)}\right]\left[1 + \frac{\delta qs_n}{\delta r}\right] + \frac{r(\delta qs_n/\delta r) - qs_n}{(r+qs_n)^2}\left[1 - (1+r+qs_n)^{-T}\right]$$

If $\epsilon_{qs,r} = (\delta qs_n/\delta r)\,(r/qs_n) \geqslant 1$, then $\delta V_n/\delta r > 0$

$$\frac{\delta V_n}{\delta T} \approx \frac{qs_n}{r+qs_n}\left[(1+r+qs_n)^{-T} - (1+r+qs_n)^{-(T+dT)}\right] > 0$$

Finally, since $p_n = p_k + \mu_{kn}$,

$$\delta V_n/\delta\mu_k = \delta V_n/\delta p_k = \delta V_n/\delta p_n = (\delta V_n/\delta qs_n)\,(\delta qs_n/\delta p_n) > 0.$$

## Appendix: A Model of the Financial Guarantee Market *(continued)*

These results are important in determining characteristics of the demand curve for financial guarantees. Each bond issuer will be willing to purchase a guarantee if the premium for that guarantee is less than or equal to these total interest cost savings, $V_n$. Bond issuers are indifferent between purchasing and not purchasing a guarantee when $V_n$ is exactly equal to the guarantee premium, PR. This equality defines an implicit "breakeven" value for the random noise factor, $\mu_{kn}$, within each risk class k. Terming this breakeven value $\overline{\mu}_k$, the following equation defines an implicit function for $\overline{\mu}_k$.

$$F(\overline{\mu}_k;\ r,p_k,T,PR) = V - PR = 0$$
$$= V(r,T,qs_n(r,p_k+\overline{\mu}_k)) - PR = 0$$

Within each risk class, $\overline{\mu}_k$ is a function of the risk-free rate, r, the "true" default probability, $p_k$, the maturity of the bond, T, and financial guarantee premium, PR. Using the implicit function theorem, it can be demonstrated that

$$\delta\overline{\mu}_k/\delta r = -F_r/F\mu_k = -(\delta V_n/\delta r)/(\delta V_n/\delta\overline{\mu}_k) < 0$$
$$\text{(assuming } \epsilon_{qs,r} \geqslant 1)$$

$$\delta\overline{\mu}_k/\delta PR = -F_{PR}/F\mu_k = 1/(\delta V_n/\delta\overline{\mu}_k) > 0$$

$$\delta\overline{\mu}_k/\delta T \approx -F_T/F\mu_k = -(\delta V_n/\delta T)/(\delta V_n/\delta\overline{\mu}_k) < 0$$

$$\delta\overline{\mu}_k/\delta p_k = -F_{pk}/F\mu_k = -(\delta V_n/\delta p_k)/(\delta V_n/\delta\overline{\mu}_k) = -1$$

where $F_x$ denotes the derivative of F with respect to x.

Using the expression for $V_n$, it is straightforward to demonstrate that total interest cost savings increase with $\mu_{kn}$. Within a risk class, then, all bond issuers with $\mu_{kn}$ greater than $\overline{\mu}_k$ will have interest cost savings greater than the guarantee premium PR and will therefore be willing to purchase a guarantee. Recalling that $\mu_k$ has distribution function $g(\mu_k;p_k)$, the share of bond issuers with $\mu_{kn}$ greater than $\overline{\mu}_k$ is $(1 - G(\overline{\mu}_k;p_k))$ where $G(\mu_k;p_k)$ is the cumulative distribution function of $\mu_k$. Using this result, the demand curve for financial guarantees in risk class k can be written as:

$$D_k = (1 - G(\overline{\mu}_k;\ p_k))\ N_k$$

The slope of the demand curve equals

$$-N_k(\delta G/\delta\overline{\mu}_k)\ (\delta\overline{\mu}_k/\delta PR).$$

The position of the demand curve is determined by the four exogenous variables r, $p_k$, T and $N_k$. Taking derivatives, it can be shown that

$$\delta D_k/\delta N_k = 1 - G(\overline{\mu}_k;\ p_k) > 0$$

$$\delta D_k/\delta T \approx -(\delta G/\delta\overline{\mu}_k)\ (\delta\overline{\mu}_k/\delta T)N_k > 0$$

$$\delta D_k/\delta r = -(\delta G/\delta\overline{\mu}_k)\ (\delta\overline{\mu}_k/\delta r)N_k > 0 \text{ if } \epsilon_{qs,r} \geqslant 1$$

$$\delta D_k/\delta p_k = [\delta G/\delta\overline{\mu}_k - \delta G/\delta p_k]N_k \gtrless 0\ ?$$

Note that in the special case when the distribution of $\mu_k$ is the same across risk classes—i.e., $\delta G/\delta p_k = 0$ — demand increases in riskier credit classes— $\delta D_k/\delta p_k > 0$. In general, however, the change in demand resulting from an increase in $p_k$ will depend upon the form of the cumulative distribution function $G(\mu_k;\ p_k)$.

### Supply

The supply side of the model is determined by the actions of insurers. The model assumes that there are J insurers, each of whom can write up to $M_k$ dollars of coverage in each risk class k. This assumption is equivalent to assuming that each insurer dedicates a fixed amount of its capital to writing guarantees and maintains a fixed exposure-to-capital ratio in each risk class. The amount of capital dedicated to each risk class is taken as given in this model; a more realistic assumption would be that insurers profit-maximize by optimizing the distribution of their capital across risk classes.

Insurers are able to offer financial guarantees because they are assumed to be more effective at assessing true credit risk than other participants in the capital market. Specifically, it is assumed that each insurer can learn the true default probability of a bond issuer, $p_k$, at some cost $c_j$. This cost is a characteristic of the insurer that is known to both insurers and bond issuers. For tractability, it is assumed that $c_j$ is distributed uniformly over [0,C].

For a given default probability, $p_k$, insurers are able to calculate the expected loss associated with writing a financial guarantee in that risk class. For this calcualtion, $p_k$ is interpreted as the "instantaneous" default probability. That is, $p_k$ is the probabilty that the bond issuer defaults in a given period. $p_k$ is assumed to be constant and independent across periods. Under these assumptions, the expected loss from a guarantee in risk class k is:

$$L_k = \sum_{j=0}^{T-1} p_k(1-p_k)^j(1+r)^{-j}B$$

$$L_k = p_k(1+r)(p_k+r)^{-1}\ [1 - (1-p_k)^T(1+r)^{-T}]$$

## Appendix: A Model of the Financial Guarantee Market *(continued)*

where it is assumed that the insurer discounts at the risk free rate and B has been set equal to 1. Taking derivatives,

$$\frac{\delta L_k}{\delta r} = \frac{p_k(1-p_k)}{(p_k+r)^2}\,[-1 + \frac{(1-p_k)^T}{(1+r)^T}[1-T(p_k+r)\,(1-p_k)^{-1}]] < 0$$

$$\frac{\delta L_k}{\delta p_k} = \frac{p_k(1+r)}{p_k+r}\,[\frac{T(1-p_k)^T}{(1-p_k)\,(1+r)^T}] + \frac{r(1+r)}{(p_k+r)^2}[1 - \frac{(1-p_k)^T}{(1+r)^T}] > 0$$

$$\frac{\delta L_k}{\delta T} \approx \frac{p_k(1+r)\,(1-p_k)^T}{(p_k+r)\,(1+r)^T}\,[1 - \frac{(1-p_k)^{dT}}{(1+r)^{dT}}] > 0.$$

Since insurers can distinguish among the true default probabilities of the bond issuers, there will be a financial guarantee supply curve and market equilibrium for each risk class k. Each insurer will provide a guarantee if the premium exceeds the expected loss plus the cost of discovering the true $p_k$. Insurers are indifferent between writing and not writing a guarantee when the premium, PR, is just equal to the expected loss, $L_k$, plus the information cost, $c_j$. This equality defines a "breakeven" value of $c_j$, $\bar{c}$:

$$\bar{c} = PR - L_k$$

All insurers with $c_j$ less than or equal to $\bar{c}$ will be willing to write guarantees. Recalling that $c_j$ is distributed uniformly over [0,C], the share of insurers with $c_j$ less than or equal to $\bar{c}$ is $(\bar{c}/C)$. This share implies that the supply curve for financial guarantees in risk class k is:

$$S_k = JM_k(\bar{c}/C) = JM_k((PR - L_k)/C).$$

The slope of the supply curve, $\delta S_k/\delta PR$, equals $JM_k/C$.

Like the demand curve, the position of the supply curve for each risk class is determined by the set of exogenous variable r, $p_k$, T, J, $M_k$ and C. Taking derivatives,

$$\delta S_k/\delta r = -(JM_k/C)\,(\delta L_k/\delta r) > 0$$

$$\delta S_k/\delta p_k = -(JM_k/C)\,(\delta L_k/\delta p_k) < 0$$

$$\delta S_k/\delta T \approx -(JM_k/C)\,(\delta L_k/\delta T) < 0$$

$$\delta S_k/\delta J = (M_k/C)\,(PR - L_k) > 0$$

$$\delta S_k/\delta M_k = (J/C)(PR - L_k) > 0$$

$$\delta S_k/\delta C = -(JM_k/C^2)\,(PR - L_k) < 0$$

### Equilibrium

The equilibrium premium rate and quantity of insured principal in each risk class can be derived from the supply and demand curves described above. Equating supply and demand, we have

$$Q_k^* = N_k\,[1-G(\bar{\mu}_k(PR_k^*, r, p_k, T); p_k)]$$

and

$$PR_k^* = Q_k^* C/JM_k + L_k(r, p_k, T)$$

where the two equations define implicit functions for the equilibrium quantity, $Q_k^*$, and premium rate, $PR_k^*$:

$$Q_k^* = Q_k^*(r, p_k, T, N_k, J, M_k, C)$$

and

$$PR_k^* = PR_k^*(r, p_k, T, N_k, J, M_k, C).$$

Using the implicit function theorem, it is possible to derive comparative static results about $Q_k^*$ and $PR_k^*$. For instance, defining the implicit function for $Q_k^*$ as

$$H(Q_k^*; r, T, N_k, p_k, J, M_k, C) = Q_k^* - N_k[1-G(\bar{\mu}_k^*; p_k)]$$

and noting that

$$H_{Q^*} = 1 + (\delta G/\delta\bar{\mu}_k)\,(\delta\bar{\mu}_k/\delta PR)\,(CN_k/JM_k) > 0$$

then the derivatives of $Q_k^*$ and $PR_k^*$ are:

with respect to r:

$$\frac{\delta Q^*}{\delta r} = -\frac{H_r}{H_{Q^*}} = -H_{Q^*}^{-1}N_k\frac{\delta G}{\delta\bar{\mu}_k}\,[\frac{\delta\bar{\mu}_k}{\delta PR}\frac{\delta L_k}{\delta r} + \frac{\delta\bar{\mu}_k}{\delta r}] > 0$$

(assuming $\epsilon_{qs,r} \geqslant 1$)

$$\frac{\delta PR^*}{\delta r} = H_{Q^*}^{-1}[\frac{\delta L_k}{\delta r} - \frac{CN_k}{JM_k}\frac{\delta G}{\delta\bar{\mu}_k}\frac{\delta\bar{\mu}_k}{\delta r}] \gtrless 0\ ?$$

if $-(\delta L_k/\delta r)\,(JM_k/C) < -N_k(\delta G/\delta\bar{\mu}_k)\,(\delta\bar{\mu}_k/\delta r)$

$$\delta S_k/\delta r < \delta D_k/\delta r$$

then $\delta PR^*/\delta r > 0$

## Appendix: A Model of the Financial Guarantee Market *(continued)*

with respect to $p_k$:

$$\frac{\delta Q^*}{\delta p_k} = -\frac{H_{pk}}{H_{Q^*}} = -H_{Q^*}^{-1} N_k \left[\frac{\delta G}{\delta p_k} - \frac{\delta G}{\delta \bar{\mu}_k} + \frac{\delta G}{\delta \bar{\mu}_k}\frac{\delta \bar{\mu}_k}{\delta PR}\frac{\delta L_k}{\delta p_k}\right] \gtrless 0 \ ?$$

$$\frac{\delta PR^*}{\delta p_k} = H_{Q^*}^{-1}\left[\frac{CN_k}{JM_k}\left[\frac{\delta G}{\delta \bar{\mu}_k} - \frac{\delta G}{\delta p_k}\right] + \frac{\delta L_k}{\delta p_k}\right] \gtrless 0 \ ?$$

if $\delta G/\delta\bar{\mu}_k > \delta G/\delta p_k$, then $\delta PR^*/\delta p_k > 0$ and $\delta Q^*/\delta p_k \gtrless 0$ ?

if $\delta G/\delta\bar{\mu}_k < \delta G/\delta p_k$, then $\delta Q^*/\delta p_k < 0$ and $\delta PR^*/\delta p_k \gtrless 0$ ?

if $\delta G/\delta\bar{\mu}_k = \delta G/\delta p_k$, then $\delta Q^*/\delta p_k < 0$ and $\delta PR^*/\delta p_k > 0$

With respect to $N_k$:

$$\frac{\delta Q^*}{\delta N_k} = \frac{-H_{Nk}}{H_{Q^*}} = \frac{1 - G(\bar{\mu}_k;\, p_k)}{H_{Q^*}} > 0$$

$$\frac{\delta PR^*}{\delta N_k} = \frac{\delta Q^*}{\delta N_k}\frac{C}{JM_k} > 0$$

With respect to C:

$$\frac{\delta Q^*}{\delta C} = -\frac{H_C}{H_{Q^*}} = -H_{Q^*}^{-1}\frac{\delta G}{\delta \bar{\mu}_k}\frac{\delta \bar{\mu}_k}{\delta PR}\frac{Q^* N_k}{JM_k} < 0$$

$$\frac{\delta PR^*}{\delta C} = H_{Q^*}^{-1}\frac{Q^*}{JM_k} > 0$$

With respect to $M_k$:

$$\frac{\delta Q^*}{\delta M_k} = -\frac{H_{Mk}}{H_{Q^*}} = H_{Q^*}^{-1}\frac{\delta G}{\delta \bar{\mu}_k}\frac{\delta \bar{\mu}_k}{\delta PR}\frac{Q^* CN_k}{J^2 M_k} > 0$$

$$\frac{\delta PR^*}{\delta M_k} = H_{Q^*}^{-1}\frac{Q^* C}{JM^2_k} < 0$$

With respect to J:

$$\frac{\delta Q^*}{\delta J} = -\frac{H_J}{H_{Q^*}} = H_{Q^*}^{-1}\frac{\delta G}{\delta \bar{\mu}_k}\frac{\delta \bar{\mu}_k}{\delta PR}\frac{Q^* CN_k}{J^2 M_k} > 0$$

$$\frac{\delta PR^*}{\delta J} = -H_{Q^*}^{-1}\frac{Q^* C}{J^2 M_k} < 0$$

The equilibrium premium volume, PM*, is the product of the equilibrium premium rate and quantity of insurance:

$$PM^* = Q^* PR^*$$

This volume moves with changes in the exogenous variables according to:

$$\frac{\delta PM^*}{\delta x} = PR^*\frac{\delta Q^*}{\delta x} + Q^*\frac{\delta PR^*}{\delta x}$$

where $x = N_k, r, p_k, C, M_k, J, T$

For most of the exogenous variables, this comparative static is difficult to sign a priori since the derivatives of Q* and PR* with respect to the variable in question have opposite signs. However, under certain assumptions, it can be shown that the equilibrium premium volume moves procyclically with interest rates. That is, assuming that

(1) $\epsilon_{qs,r} \geqslant 1$

and (2) $\delta S_k/\delta r < \delta D_k/\delta r$

then $$\frac{\delta PM^*}{\delta r} = PR^*\frac{\delta Q^*}{\delta r} + Q^*\frac{\delta PR^*}{\delta r} > 0$$

Note that these are sufficient (but not necessary) conditions for this result to hold.